

Design and the Circular Economy in the UK Blinds and Shutter Industry

Deborah Andrews and Zoe De Grussa London South Bank University
Andrew Chalk and Dave Bush British Blind and Shutter Association

Abstract

Blinds and shutters have been used around the world for hundreds of years. They offer building occupants privacy and security and contribute to health and wellbeing; they can also reduce energy consumption for heating and cooling which is environmentally and economically beneficial. Current design and manufacturing processes mean that disassembly is relatively easy, which facilitates reuse, repair and ultimately recycling. At present these practices are limited and most blinds are either sent to landfill or incinerated at end-of-life. In this chapter we propose that design is key to extending current good practice in and accelerate the development of a Circular Economy for this sector.

History and context

Blinds and shutters have been used around the world for hundreds of years to cover unglazed and glazed window openings although the precise origin and date of invention is unknown. Early examples were made from natural materials including wooden slatted ‘venetian’ blinds, which were introduced from Persia to Europe and America. Since the middle of the 18th century there have been numerous patented and unpatented innovations and currently there is a wide range of internal shading devices including venetian, roller, pleated, panel, vertical and mid-plane blinds, shutters, screens, and tensile structures. The range of external devices also includes roller and venetian blinds, both fixed and moveable louvre arrays, tensile structures, canopies, and awnings. Like form, shading properties also vary and blinds may be opaque, dim-out, semi-transparent, sheer or perforated screen. Early blinds were all manual but the market now includes motorised shading products that were initially developed because manual operation was difficult or impossible in some locations; motorisation is continually evolving and building facades can now include automated ‘intelligent envelopes’ that react and change in response to the exterior climate and position of the sun. Although the majority of interior shading products remain manually-operated mechanical products, the number of motorised and automated products is increasing in keeping with user interest in electric products.

The functions and benefits of blind use

Blinds and shutters have various functions which can be divided into two main groups namely:

- psychological: aesthetics, fashion, privacy and safety
- practical: as contributors to thermal and visual comfort well-being and productivity, energy saving, and security.

Aesthetics tend to be the main driver of choice for end users and specifiers (such as architects) even though the practical functions have a more significant long term impact on the environment and building occupants. If specified and used correctly shading products attenuate daylight and reduce thermal gain during the day and thermal loss during the ‘heating season’ and at night. In fact theoretical models show that they can save up to 15% energy

when used with double glazed windows (Dolmans, 2006) and 25% energy when used with single glazed windows (Hutchens, 2015). While temperature control and thermal comfort can improve productivity in the workplace, it is essential for the wellbeing of very old and very young people, both of whom can suffer from ill health and even death if exposed to low or high temperatures for prolonged periods in the interior environment.

Blind technology and user behaviour

Currently in the UK many blinds are incorrectly specified or underused (i.e. they are raised and lowered infrequently) and therefore many of the benefits listed above are not fully realised. This may be due to the fact that the majority of blinds in residential properties are manually operated although residents' behaviour and blind use may change if more motorised blinds are installed as illustrated in a European study which shows that motorisation encourages user engagement and residents raise and lower motorised blinds more frequently than manual blinds (Paule et al, 2015). Motorised products are either hardwired or battery operated and controlled with a hand-held or attached device; The installation of external and internal motorised and automated shading systems is increasing in both residential and non-residential buildings; interestingly in this setting users prefer motorised and semi-automated blinds to fully automated blinds because they can control them to suit their personal preferences (Frontczak et al., 2012). The environmental impact of this type of blind is higher of course than that of manual blinds because they include electrical and electronic components. However, Life Cycle Assessment studies show that the environmental benefits derived from the energy savings associated with blind use outweigh the embodied impact of manual blinds (Andrews et al, 2015) and outweigh the embodied and operational impact of motorised blinds (Andrews et al, 2016).

Market size and growth

It is estimated that 50 million blinds are already installed in homes in the UK where annual sales of blinds typically exceed £550 million (AMA Research, 2014). This equates to between 4 and 5 million individual products, about 80% of which are residential sales and 20% non-residential and although some are replacement products many are new sales. A number of factors indicate that both markets will increase: for example, the UK government plans to build 1 million new homes between 2015 and 2020. Sales will also increase as the functional benefits of blinds and shutters are becoming more widely recognised and new building performance guidelines that balance wellbeing and environmental factors are being developed. At present average product life span varies from 5 – 20 years; length of life is influenced by quality and durability of components, the way in which blinds are used and maintained and frequency of decoration, which tends to be every 5 years on average; this activity may involve replacement of blinds for aesthetic reasons rather than because they no longer work and consequently many functioning products are wasted.

It is evident that millions of tonnes of materials and kilowatts of energy are embodied in this product sector and unless reused, reprocessed and/or recycled at end-of-life a considerable quantity of resources will be wasted. We now discuss the various factors related to a Circular Economy for this sector.

The design and manufacture of blinds

Many complete (readymade) blinds and components (including the majority of motors and batteries for motorised and automated blinds) are now imported from China for example. Nevertheless, there are still a number of major component manufacturers in Europe and the UK where the blind and shutter industry is well-established and semi-industrialised. It evolved as a cottage industry alongside the interior furnishing industry, and although several companies employ 500+ workers about 75% of businesses employ 1-5 people. Larger businesses either manufacture or buy in components and assembly is machine-based but in many small businesses components are bought in and products are assembled by hand (Experian, 2014). Both historical and current business practice have therefore influenced the design and manufacture of the three groups of blind components (operating, shading and fixing), the majority of which push or snap fit together.

Many of the mass-produced operating components are made from single polymers, but some are comprised of sub-components made from different materials; these include different types of polymer or polymers and metals. The shading components are also made from single materials (e.g. textile, aluminium and wood) and from composites (including polyester laminates and resin and glass fibre). Many are manufactured to standard dimensions while others cut to size for bespoke blinds; the majority of these components are then sewn by machine although some producers still sew by hand. Finally, when complete, the blinds are installed using mechanical fixings such as screws. The fact that the blind and shutter industry evolved alongside the furnishing industry has a major influence on perception of shading products and rather than being seen as building or architectural components they are still frequently regarded as fixtures and fittings and consequently, their perceived value is often relatively low.

These are all important considerations for the Circular Economy because they influence overall product lifespan, final treatment at end-of-life and will influence any recommendations for changes in practice.

Current business practice and the Circular Economy

In addition to manufacture and installation a number of businesses specialise in the cleaning, maintenance, repair and refurbishment of blinds, all of which extend product life. These activities are partly facilitated by current component design in that they have been developed for assembly by hand and/or machine and the majority push or snap fit together. As a result, disassembly of complete components can be relatively uncomplicated (although it can be time-consuming). In some instances however, components are designed for one-way fit in which case they may be destroyed and replaced as part of the maintenance, repair and refurbishment procedure. Currently the focus of service companies tends to be non-residential properties where maintenance contracts are commonplace. There are also a number of products on the market to aid cleaning and maintenance of domestic blinds but this is not the case for repair and consequently many domestic blinds that could be repaired are replaced. The cost of professional maintenance and repair may also be higher than replacement, which also discourages repair of residential blinds.

Some manufacturers offer blind refurbishment services where operating components are reused and shading components are changed to compliment new decorating schemes for example. This service tends to apply to roller or Roman-type textile blinds because it is easier,

quicker and more cost effective to replace textile panels that louvres or slates for example. Product refurbishment can extend blind life by many years but eventually these products will reach end of life which is now discussed.

Shading Products at End-of-Life (EoL) and the Circular Economy

Although there is no scientific data about treatment at end of life anecdotal information indicates that the location where the blinds are installed (housing or otherwise) and type of installers (residents or businesses) influence treatment at end-of-life and that the predominant scenarios are the same as those for many other products:

- being sent to landfill as waste – where all material value is lost
- being incinerated as waste - where all material value is lost
- being incinerated with energy recovery – where some value is recovered
- partial recycling – where some material value is recovered

Many blinds from the residential sector end up in municipal waste sites if disposal is the responsibility of the homeowner / resident, in which case they are either sent to landfill or incinerated with energy recovery. There is some evidence of reuse when blinds are resold through second-hand or charity shops but this is comparatively infrequent.

Blinds can end up as construction ‘waste’ although this is becoming less common because materials with economic value (especially metals) tend to be removed from buildings prior to the final demolition. If the blinds are not removed and become mixed with the other rubble to become hard core that is used in new construction projects however, it could be argued that they have retained some value and have been downcycled.

When blinds are replaced by professional sales and installation companies (who service both the residential and non-residential markets) the old products tend to be recycled in part. The major metal components are stripped out and recycled along with off-cuts from the manufacturing and assembly process while mixed-material, composite, polymeric and textile components are generally disposed of as general waste. In this context recycling is incentivised by relatively high commercial waste disposal charges and the payment for metals; this is not the case for homeowners / residents however who have no financial incentives to recycle. Recycling rates may increase as more motorised and automated blinds are installed because they include electric motors, batteries and other electronic components. Although these blinds have a higher environmental impact than manual blinds they could encourage Circular behaviour because owners are obliged to recycle at end of life to meet Waste Electrical and Electronic Equipment (WEEE) legislation.

What can designers do to encourage a more Circular Economy for this sector?

It is evident that activities associated with the Circular Economy are already well-established in the blind and shutter manufacturing and allied service industries but there is potential to improve and extend these activities by redesigning products and services. These changes could also be economically beneficial to the industry and end-users, reduce environmental impact and conserve resources although introduction will probably depend on economic viability. For example:

- Design components that enable damage-free disassembly: change one-way push fit parts e.g. ensure they deform for separation
- Design components that enable rapid disassembly
- Reduce the number of components that are comprised of more than one material: component materials are selected for their specific properties however so if it is not possible to substitute material types then redesign the sub-components to ensure that they can be easily separated.
- Encourage repair at home: design and sell repair kits with easy-to-follow guides
- Increase refresh services by manufacturers and at home to extend the life of operating components
- Design guides to educate customers about maintenance, repair and refurbishment and include information (and possibly a tool) to encourage disassembly and separation of parts for recycling. Add the guides all blind packages.
- Develop more comprehensive business service models where companies own blinds and 'sell shading'. Examples exist in the non-residential sector but this could be extended to the residential sector: this model will encourage better management over product life which will aid maintenance and repair (which will extend product life) and treatment at end of life (which will increase recycling rates). Improved product management will also encourage component harvesting and remanufacture where appropriate and component reuse. In this case durability will have to be monitored but this can be carried out as part of regular maintenance services.

Conclusion

This chapter began by briefly describing the history of shading products, their functions and benefits arising from use. It then discussed user behaviour and the fact these benefits are not fully realised at present; however motorised blinds increase user interaction, which will reduce energy consumption for heating and cooling and increase thermal and visual comfort. Although motorised blinds have a higher environmental impact than manual blinds Life Cycle Assessments show that the environmental benefits deriving from use outweigh these impacts. LCA also shows that product refurbishment and recycling of some if not all components at end-of-life is environmentally beneficial. The UK shading product market is already large and will increase concurrently with the construction of new buildings and the introduction of new standards for well buildings. The blind and shutter industry is also well-established and includes many examples of good practice that are integral to the Circular Economy. However, several changes in component design and business practice are advocated; these will extend product life and reduce waste of materials and embodied energy by facilitating repair, refurbishment, component harvesting, reuse and recycling at end-of-life.

At present the residential market is four times larger than the non-residential market but there is little evidence of these 'Circular' activities in that sector and consequently a considerable quantity of materials and embodied energy are wasted. Furthermore, waste will increase concurrently with the predicted increase in sales. Some of the design proposals could encourage more Circular behaviour by building occupants but they must be supported by the introduction of comprehensive service-based business models that allow for professional management through all stages of the product life cycle. There are already examples of excellent practice in the blind and shutter industry but they can be improved and extended through design and its importance in the development and implementation of a fully Circular Economy for this sector should not be underestimated.

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